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"Towards an Affordable National Security Space Program"

Keynote Address of
The Under Secretary of Defense for Acquisition and Technology
Dr. Paul G. Kaminski

to the
NSIA Space Policy, Strategy and Architecture Conference
Crystal Gateway Marriott Hotel, Arlington VA

March 5, 1996

Thank you for that kind introduction. Let me say, it's a great pleasure for me to be with you here today and to be able to share my views with you on where I think the Department of Defense is headed in Space in the first part of the coming century.

I think it's critical that we address the issues before us in space and I think Bob Davis has put together a forum here that will help us engage these issues in a constructive way. I also want to thank the NSIA for hosting this meeting.

Let me begin my remarks with a challenge.

I challenge you all to journey outside of the "box". . . to view this discussion as an opportunity to challenge the traditional thinking on how we procure, launch and employ our space based assets. Most importantly, over the next two days I want you to leave your comfort zone. Be creative. Be bold. Press the envelope of your own thinking.

You know, both the Department of Defense and our civil space program have produced a string of achievements in space – of space firsts – of which we can all be proud. Many of the successes of our past can be directly attributed to this audience. You are the ones who have provided the leadership in the past and it is you who will carry us forward as we move into the next century. But the rules of engagement for space have changed and with them our thinking must also change.

The history of US space accomplishments is long and distinguished. It is a history which provides us an in-depth perspective with which to approach the future. But history should be just that – a point of reference – a point of departure; the high ground from which we observe the battlefield. We need to use history to provide us with perspective, not to be trapped by its familiarity.

It seems to me then, that my challenge and your 's is to filter this knowledge of our past, couple it with the needs of the future, and develop creative solutions to solve some very difficult problems. In some cases, these problems are technical. In others,

fiscal reality is the driver. Either way, it is a constant balancing act. We've got to balance the security needs of the nation with the need to protect the taxpayer's dollars. It's not a trivial problem, especially in view of the cost of doing business in space. But it's a problem I think we can solve.

Having said that, let me talk a little bit about two of the specific challenges we face. They are the twin challenges of how do we plan for our needs and how do we afford what we've planned.

CAPABILITY BASED PLANNING

The world has changed. The cold war era has passed and we no longer live in a bi-polar world. Instead, we are increasingly faced with simultaneous regional conflicts erupting around the world. Our defense planning has shifted from the threat driven paradigm that has existed over the past 50 years to a broader based capability and risk management paradigm. Today and in the future, we will use military force with greater precision, less risk, and more effectiveness.

Space is a major player. At the same time, it is not the only player. How well we integrate our space systems into the larger "system of systems" will determine how effective we will be as "warfighters". At the risk of stating the obvious, the basic tenets of the Air, Sea, and Land Battle have not changed. We must dominate the battle field through the ability to concentrate our superior firepower. To do so, we must have a superior knowledge of the disposition of our own and enemy forces.

The Gulf War -- the so-called first space war illuminated our many strengths, but it also revealed some limitations. From the unmatched precision of GPS guided munitions, to the tactical warning afforded by space based missile sensors, the space systems used during the war worked just the way they were supposed to -- in many cases better.

But what they failed to do was work together as a fully integrated system-of-systems. Our reconnaissance satellites took plenty of pictures of the battlefield—but our communications systems didn't have the capacity to transmit them, and even if they did—the analysts would have been saturated. Surveillance satellites told us when a SCUD was launched, but lacked the interface with GPS to give us precise coordinates. These were symptoms of a bigger problem. No one was charged with the responsibility to make sure it all matched—that it all worked together.

When I began my job nearly a year and a half ago, I saw a proliferation of activities across the Department involved in defining space architectures. My sense is that this decentralized approach has produced competing and stovepiped architectures and does not work very well.

We have reorganized the DoD's management of national security space activities to eliminate this problem. My guiding principles for this reorganization are

- One, the architecture function should be centralized;
- And Two, the acquisition and operations execution functions should remain decentralized.

Our first step in the reorganization process was to get the Department's own house in order by establishing a Deputy Under Secretary of Defense (DUSD) for Space within OSD. Bob Davis was appointed as the first DUSD for Space in August of last year, he is tasked with the management of all space activities within DoD.

Then in September of last year, we established the DoD Space Architect, General Bob Dickman, USAF, He is tasked with the responsibility for developing and maintaining an integrated defense space architecture. Bob's major challenge is to put together specialized DOD space architectures starting with space communications and space control.

Our final step was to create the Joint Space Management Board (JSMB) in November 1995. Made up of senior members from both the DoD and Intelligence community, the JSMB's function is to close the coordination gap between our two communities.

Having centralized the planning and coordination functions through DUSD (Space), the Space Architect, and the JSMB, we have the organization in place to allow us to plan for our needs.

And through this organization some new thoughts and approaches are beginning to emerge. No longer do we think in terms of purely military space architectures where the DoD makes the entire root investment.

Making the most of satellite communications--including the services provided by leased commercial satellites--has become the hallmark of the services' C4I efforts since DESERT STORM. We are using commercial satellites to put all kinds of information and data into the hands of our forces.

No where is this more evident than in the measures we're taking to improve the communications infrastructure to our forces across Europe and the Bosnia area of operations. We are doing this in two ways: first, using commercial TV satellite technology to provide a direct broadcast communications capability; and secondly, by fielding a wide bandwidth, secure tactical internet through fiber and commercial business satellite transponders to allow for distributed collaborative planning among deployed C2 (Command and Control) nodes.

What this means to our forces is that everyone with the proper receive antenna, cryptologic equipment and authentication will have access to the same data, at the same time. But, more importantly, the fielding of this capability will allow us to install and utilize, for this operation, some of the more advanced C4I capabilities being developed by the Government and industry today for use in the Global Command and Control System (GCCS).

We are seeing great strides with global broadcast systems that can give us hundred fold kinds of improvements in the bandwidth that we can transmit to our forces. What is being developed commercially today is a static direct broadcast TV system where the receiver locations are known and the programming is fixed.

For DOD and intelligence use, we will need a more dynamic system that can deal with users who are moving in the field whose location isn't known *a priori* . Rather than fixed programs, we also need to allow them to be able to interactively control the beams and control the programming.

REDUCING THE COST OF SPACE SYSTEMS

Now let me address the challenge of affording what we have planned. The key question is. . . Can the Department and the Intelligence Community afford to modernize national security space systems? We know that space system complexity, like that of advanced fighter aircraft, will continue to increase--dramatically in many cases.

Norm Augustine pointed out some years ago that the cost of each successive generation of fighter aircraft was increasing geometrically. As a result, although fighter aircraft were becoming more and more capable, the United States could afford fewer and fewer of them. Augustine's projection—an extrapolation of aircraft unit cost as a function of deployment date--was that some time in the middle of the next century the U.S. would only be able to afford one fearsomely sophisticated aircraft and the military services would each take turns flying it!

The key point to remember is that Augustine's prediction is empirical. It is based upon *our past experience and processes* for handling the interplay of increasingly complex technologies. We—industry and the DoD—clearly need to share responsibility for finding an alternate path to field affordable, modern systems.

INDUSTRY ROLE

I believe space industry must continue to make a cultural change—already under way today—by shifting from serial to integrated processes for product development

and support. Integrated Product and Process Development (IPPD), also known as concurrent engineering, stresses cross-functional evaluations and a shared vision of the system.

Use of standard, relatively inexpensive computer equipment, virtual prototypes and simulations helps to bring together a shared vision of the system and provides a means for understanding the complex interactions among the configuration items in the system design.

The real power of a computer based modeling and simulation system lies in the connection and coordination between the tools and functional users. We will need systems that leverage the national information infrastructure and provide a seamless environment for geographically distributed teams and a diverse set of functional users.

The bottom line is that integrated product and process development, backed up by a strong commitment to computer based modeling and simulation tools, can provide a dominant competitive edge in the commercial marketplace and a clear warfighting edge on the battlefield. It enables consideration and development of alternate paths for getting to market first and at a lower cost. In the process, quality is improved. Products are customized.

Let's look at two commercial examples--spanning the technology spectrum. The first is Boeing's use of Computer Aided Three Dimensional Interactive Applications—IBM's CATIA software—for the development of the 777 aircraft. Boeing's management made the decision to change the culture of the company and invest $100 million in a computer aided development capability. The bigger "investment" was in the total corporate commitment to this approach. . . there was no fall back approach in place.

As a result, there is no physical mock up for an aircraft with 85,000 components and over four million parts. The goal is to achieve the same number of manufacturing hours as the 767--for an aircraft with 57% greater empty weight--by reducing the number of design changes to at least one-half of that experienced on the 767. To date, Boeing is reporting a 93% reduction in the number of design changes.

My second example illustrates the point that computer assisted integrated product development is not just for large corporations. In this case, Kohler's Engine Division is a producer of small 5-25 horsepower 4-cycle lawn mower engines. This company is a small player in a big field. The business strategy is fairly straightforward--sell engines by offering superior performance and high reliability at a lower cost.

Kohler has been using state-of-the-art CAD/CAM tools to introduce new designs that are radically different from earlier versions—quite a departure from the evolutionary change approach traditionally practiced by this industry. At Kohler,

manufacturing cycle times have been cut by two years. Physical prototypes are no longer necessary. Kohler offers a 2-year warranty—the longest in the industry.

As a result, John Deere selected Kohler for its line of lawn mowers instead of the previous supplier—Kawasaki. Kohler's market share has continued to grow significantly over the past several years. My point is that the technologies for integrated product development, virtual prototypes, and modeling and simulation are widespread and available to smaller corporations. If correctly managed, transition costs should not present an insurmountable entry barrier to smaller, moderate sized corporations.

Another conclusion I draw from these two examples is that world class producers across both ends of the manufacturing spectrum—from 777 aircraft to 25 horsepower lawn mower engines—are being driven by market forces and are finding a way to establish exit ramps off of Augustine's cost forecast for fielding increasingly complex systems. Similar examples exist in the case of commercial satellite communications and navigation systems. Remote sensing satellites now offer to anyone who can pay, the opportunity to view their home with enough clarity to count the cars parked in the drive.

If the underlying technology is widespread and market forces are driving industry towards an integrated product development approach, what is DoD's role in charting a new course for making weapon systems more affordable?

DEPARTMENT OF DEFENSE ROLE

Simply stated, the Department needs to become a smarter buyer in both what and how we buy defense equipment. To me, the "what to buy" question is far more important than "how to buy."

What to buy

To determine what we will buy, the Department is placing considerable emphasis on a systems-of-systems decision making. Our goal is to select the most cost-effective mix of type and number of individual systems for development and fielding.

I foresee a need for a hierarchy of models and simulations at the engagement, mission and campaign levels to help the Department make the "what to buy" decisions. In addition, I envision extensive use of constructive models and simulations for these system-of-system evaluations. Eventually, I see greater use of virtual simulations in which virtual prototypes are operated on synthetic battlefields.

Without question, the Department will move to make greater use of simulation based evaluations of systems. As we do so, the Department must ensure that these

assessments are made in a controlled and repeatable environment. For example, the Department is taking steps to establish such an environment, known as the C4ISR Decision Support Center for evaluating systems in a combined C4I (Command, Control, Communications, Computers and Information) and ISR (Intelligence, Surveillance and Reconnaissance) environment.

How to buy

The Department must also change it's approach for "how to buy" systems. I have placed removal of DoD-imposed obstacles to implementation of integrated product development, virtual prototyping and commercial practices at the top of my priorities list. My goal is to evolve the Department's acquisition management culture to take advantage of these new approaches.

Several initiatives are on-going. In June 1994, the Department began shifting to performance based specifications. Last summer, we implemented an overarching integrated product team (OIPT) process within OSD and among the military services to increase communication among the functional staffs and cut the Department's Defense Acquisition Board (DAB) decision cycle times. In December 1995, the Department implemented a "single process initiative" to promote consolidation to common processes on a facility-wide basis.

In another effort to streamline our processes and lower entry barriers, we convened an Electronic Contracting-Electronic Data Interchange process action team. The Department implemented many of the team's recommendations and instituted mechanisms that permit soliciting and approving procurement actions electronically. I am pleased to announce that the Air Force was able to take advantage of this new mechanism last year when it released it's first ever electronic RFP for the Extended Expendable Launch Vehicle Program.

We are institutionalizing our "how to buy" initiatives, including the use of virtual prototypes and modeling and simulation, in a new version of the Department's 5000 series acquisition regulations. The new regulation will strongly encourage the use of models and simulations to improve quality and to reduce acquisition time, resources, and risks. It will also encourage embedding virtual prototypes in synthetic environments to support requirements definition, concept exploration, manufacturing and testing of new systems.

SUMMARY

In summary, our challenge is clear cut--break the trend of geometrically escalating costs in successive generations of defense equipment. Limiting the sophistication, and therefore, the capability of future systems is not a realistic option.

Our task is to field increasingly complex technologies at a more affordable cost on shortened acquisition cycle times.

It is clear to me that this task is well understood in the commercial sector. Market driven competition from world class producers are forcing a renaissance in traditional approaches to development of commercial products—from 777 aircraft to lawn mower engines. We are now seeing the emergence of close knit teams, working together, and employing an integrated product and process development approach that fully integrates the use of virtual prototypes and simulation into the design, manufacturing, test and support of products.

It is going to take a team effort by industry and the DoD to field a superior capability, affordably and in less time than our potential adversaries. Industry needs to continuously upgrade their integrated product development capabilities using the latest information technologies. The DoD has centralized the planning function through DUSD (Space), the Space Architect, and the JSMB. We have the organization in place to allow us to plan for our needs.

Our options at this time are best captured by Lyndon B. Johnson in an address to the nation on November 28, 1963: **"Yesterday is not ours to recover, but tomorrow is ours to win or lose."**

I ask you to work with us as a team—become agents of change in creating a legacy for US space forces in the year 2010.